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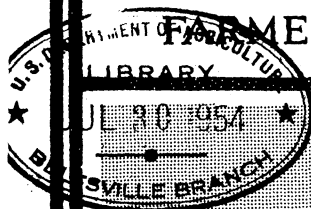
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SAVING MAN LABOR IN SUGAR-BEET FIELDS



BY USING larger equipment many sugar-beet growers have greatly reduced their requirements for man labor and at the same time have been able to accomplish more work in a given time. This bulletin tells how man labor can be saved and production speeded up in the several American sugar-beet regions through the use of large machines and units of power.

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SAVING MAN LABOR IN SUGAR-BEET FIELDS

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CONTENTS

	Page		Page
Factors in saving man labor-----	1	Cultivating-----	7
Plowing-----	2	Lifting-----	9
Disking-----	4	Mechanical lifters and toppers-----	10
Spike-tooth harrowing-----	5	Hauling sugar beets-----	12
Spring-tooth harrowing-----	5		

FACTORS IN SAVING MAN LABOR

Labor is by far the largest item of expense in the production of an intensive crop like sugar beets, and the sugar-beet grower should think of machinery in relation to his business as the manufacturer thinks of machinery in relation to his business.

A reduction in the man labor required for the production of sugar beets lies mainly in the selection of the proper size and type of implements and the proper choice of motive power. On many sugar-beet farms much man labor is expended unnecessarily on operations which do not utilize such labor to the best advantage. An increase in the number of horses used for a given operation generally implies the use of a larger implement and usually results in reducing the time required and the amount of man labor necessary to complete the work.

The normal man-labor requirement in growing sugar beets varies from 80 to 135 hours or more per acre, of which the machine operations constitute from 25 to 45 per cent, and the remainder is represented by the hand operations; blocking, thinning, hoeing, pulling, topping, and loading. For purposes of illustrating savings in man labor in the former group, examples are given of the effect on the man-labor requirement of the use of different-sized crews and different size and type of implements. It is true that large equipment can not be used to advantage on all sugar-beet farms, but on some farms there are single-bottom walking plows where two-bottom sulky plows could be used to good advantage. On other farms there are one-row walking cultivators where four-row riding cultivators could be used and would increase the efficiency of the worker by four. The examples shown in the illustrations in this bulletin should suggest to sugar-beet growers possible advantages that may accrue to them by a modification of their present practices.

¹ This bulletin was revised by R. S. Washburn and contains some added material.

There is considerable variation in the size of implements and size of crews employed in various sugar-beet districts and in the amount of work accomplished by these crews.² Very large equipment is com-



FIG. 1.—Plowing under clover and timothy sod with a single-bottom two-horse walking plow. Compare with Figure 2

mon in California, where sugar-beet production is on an extensive scale. Sugar-beet equipment in Colorado, Montana, Idaho, and Utah is, for the most part, much larger than in Michigan and Ohio.

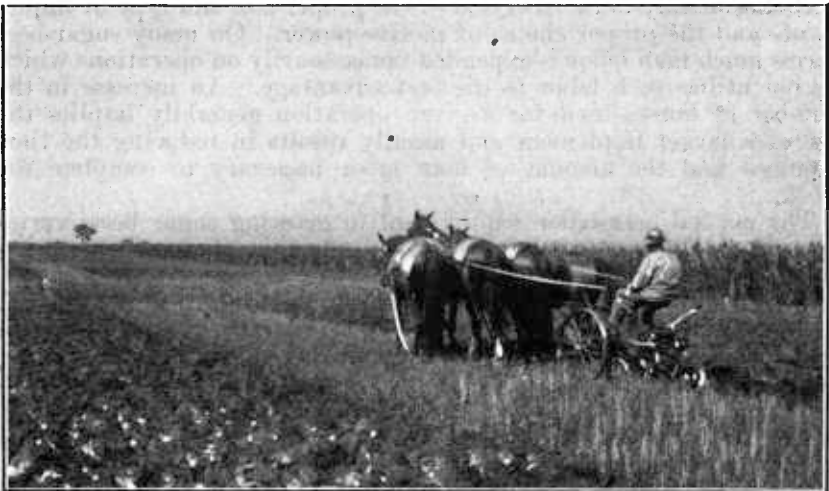


FIG. 2.—Plowing with a two-bottom four-horse plow. With this equipment the ground is plowed twice as fast as with that shown in Figure 1

PLOWING

In Michigan and Ohio, single-bottom plows and one-man and two-horse, and one-man and three-horse crews predominate. These

² The data on which this bulletin is based were secured in the sugar-beet districts of Michigan, Ohio, Colorado, Montana, Utah, Idaho, and California.

crew sizes are about equally divided. Only a limited number of growers use one man and four horses. Under similar conditions one man and a two-horse walking plow will cover about $1\frac{1}{2}$ acres per day; a three-horse sulky plow will cover 2 acres per day, and one



FIG. 3.—Dry plowing with a single-bottom sulky plow and a crew of one man and six mules. This outfit will accomplish only one-third as much work as the one shown in Figure 4

man and four horses and a two-bottom riding plow will cover 3 or more acres per day. From the standpoint of man labor saved the advantage of the larger crew is evident. (Figs. 1 and 2.)



FIG. 4.—A 3-bottom plow with float attached drawn by tractor power. With this equipment the ground is plowed three times as fast as with that shown in Figure 3. In addition to saving time and man labor it has the advantage of pulverizing the soil by means of the planker or float

In other sugar-beet districts crew sizes of less than one man and three horses are not common. Figure 3 shows one man and six mules engaged in dry plowing in California with a single-bottom plow. Figure 4 shows a 3-bottom plow drawn by tractor power in the same region. A float or planker is attached to the plow which

pulverizes the soil at little additional effort or cost. The 6-horse single-bottom plow requires one man, while two men with the tractor handle the 3-bottom plow and do some clod mashing besides.

Where sugar-beet production is on an extensive scale and where especially deep plowing is practical, as in California, larger units



FIG. 5.—Disking with a single disk and a crew of one man and two horses. Compare with Figure 6

of power can be used to advantage than in some other regions where the acreage is small and the investment in extra horses and large equipment would not be warranted.



FIG. 6.—Disking with a single disk and a crew of one man and four horses. This outfit covers the ground one-third faster than the one shown in Figure 5

DISKING

Disking is a minor operation in most sugar-beet regions except in Michigan and Ohio, where it is common. In the latter districts the crew sizes for this operation, where horsepower is used, vary from

one man and two horses (fig. 5) to one man and four horses (fig. 6); still other growers use tractor power. (Fig. 7.) Four horses and a single disk will cover one-third more acreage per day than the 2-horse single disk; the tractor double disk will cover three times as much acreage per day as the 2-horse single disk.

SPIKE-TOOTH HARROWING

Harrowing with the spike tooth is practiced on a majority of sugar-beet farms. The most usual crews in Michigan and Ohio consist of one man and two horses and one man and three horses; those in Colorado, Montana, Utah, and Idaho consist of one man and four horses. In California a crew of one man and four horses or one man and



FIG. 7.—Disking with a double-disk harrow drawn by tractor power. Disking with this outfit requires less than one-third the time required by the one shown in Figure 5

six horses is most common. Comparatively little spike-tooth harrowing is done with tractor power. There is considerable variation in the number of times the land is harrowed in the different districts. It requires a full day for one man and two horses with a two-section harrow (fig. 8) to cover as much ground as can be harrowed in two-thirds of a day by one man and four horses with a three-section harrow. (Fig. 9.) As a rule an increase in the number of horses from two to three does not result in the use of a larger implement but does mean that the ground is covered a little more rapidly.

SPRING-TOOTH HARROWING

The use of the spring-tooth harrow in the preparation of land for sugar beets is most common in Michigan and Ohio, and it is used to a limited extent in other sugar-beet districts. In some districts,

especially in California, some of the work of the spring-tooth harrow is performed by the chisel. Horses are largely used for this work, although a considerable amount of the power for spring-tooth harrowing is furnished by the tractor.



FIG. 8.—Harrowing with a two-section spike-tooth harrow and one man and two horses. Compare with Figure 9



FIG. 9.—A three-section spike-tooth harrow drawn by four horses abreast. This outfit covers one-half more ground in a day and does it more easily than does the one shown in Figure 8

A crew of one man and two horses is at a decided disadvantage over the 1-man 4-horse outfit from the standpoint of man labor saved. The former, operating a 2-section spring-tooth harrow, will cover from 7 to 8 acres, whereas a 3-section spring-tooth har-

row and one man and four horses will average from 12 to 14 acres, and a 3-section spring-tooth harrow drawn by tractor power will cover from 20 to 24 acres per day. (Figs. 10 and 11.)

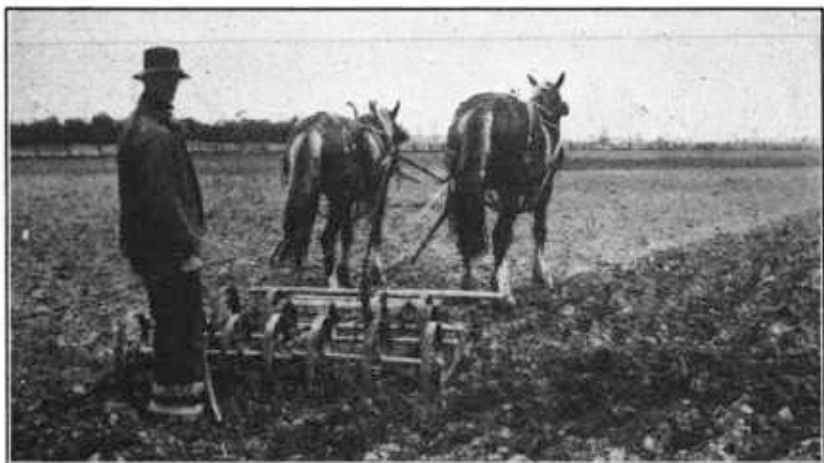


FIG. 10.—A two-section spring-tooth harrow drawn by two horses. Compare with Figure 11

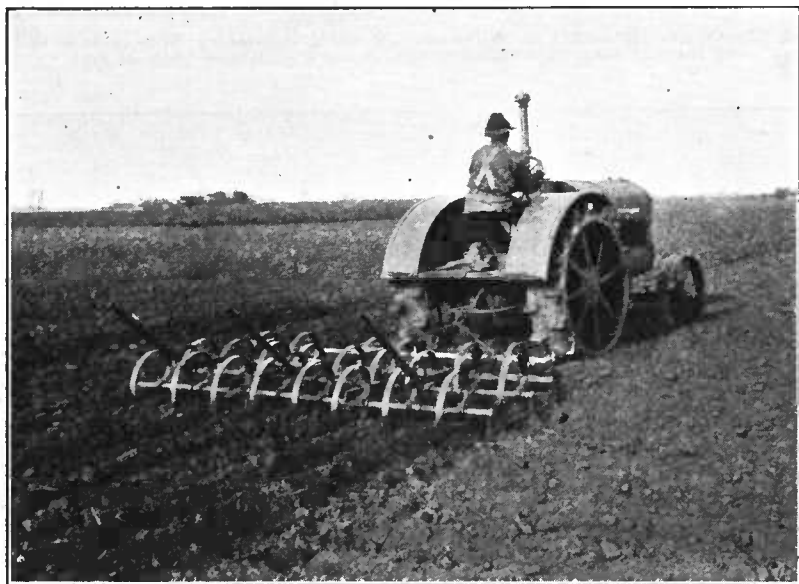


FIG. 11.—A three-section spring-tooth harrow drawn by tractor power. This outfit harrows three times as fast as the one shown in Figure 10

CULTIVATING

Variations in the type of cultivator used furnish striking contrasts in man-labor efficiency. In Michigan and Ohio, four types of cultivators are used, represented by the one-horse one-row walking culti-

vator, the one-horse two-row walking or riding cultivator, the two-horse two-row riding cultivator, and the two-horse four-row riding cultivator. In other districts a majority of sugar-beet growers use a two-horse four-row riding cultivator. The acreage of sugar beets



FIG. 12.—Cultivating with a one-horse two-row riding cultivator. This outfit is easier on the man than the walking cultivator and it cultivates twice as fast



FIG. 13.—Cultivating with a two-horse four-row riding cultivator. This outfit has double the power of the one-horse walking cultivator and cultivates four times as fast

that can be cultivated per day depends to some extent on the width of row, which ranges from 16 to 28 inches. On the basis of rows of equal width, the one-horse one-row walking cultivator requires a full day to cultivate as much as a one-horse two-row riding cultivator will

do in one-half day, and as much as a two-horse four-row riding cultivator will do in a quarter of a day; hence there is a distinct saving in man labor by using the larger equipment. (Figs. 12 and 13.)

On small acreages it may not be feasible for a grower to own a four-row cultivator, but in many cases such an implement might be owned cooperatively and serve several farmers. Again, many fields require attention before it is possible to get the work started, therefore, any saving in time is a distinct advantage to the growing crop and affords more time for such crops as compete with sugar beets in the distribution of man labor.

LIFTING

A majority of the beet growers in Michigan, Ohio, Utah, and Idaho do their lifting with one man and two horses. A compara-



FIG. 14.—Lifting sugar beets with a one-row lifter and two horses. Compare with Figure 15

tively small number use one man and three horses; in Montana, lifting is done mainly with two-horse and three-horse crews; in Colorado, two-horse, three-horse, and four-horse crews are used; in California the crews range in size from one man and three horses with a one-row lifter to one man and 10 horses with a two-row machine. There is a fairly uniform reduction in the man-labor requirement from the smallest to the largest, with a corresponding increase in the horse-work requirement as the number of horses is increased.

Under average conditions, with a one-row lifter a crew of one man and two horses, working continuously, will lift approximately $1\frac{1}{2}$ acres of beets per day. (Fig. 14.) A crew of one man and three horses will probably increase this to 2 acres per day (fig. 15); one man and four horses should lift $2\frac{1}{2}$ acres per day. (Fig. 16.) The performance of this implement can be improved still further with the addition of more horses or tractor power. (Fig. 17.) It is a common practice in some sugar-beet sections either to hire the lifting or a part of the hauling done. If by using an extra horse on the

lifter this work can be performed in a shorter period, more time will be available for hauling beets to the factory or loading station.

MECHANICAL LIFTERS AND TOPPERS

Some progress has been made in the development of mechanical beet-harvesting machines, but as yet they are still in the experi-

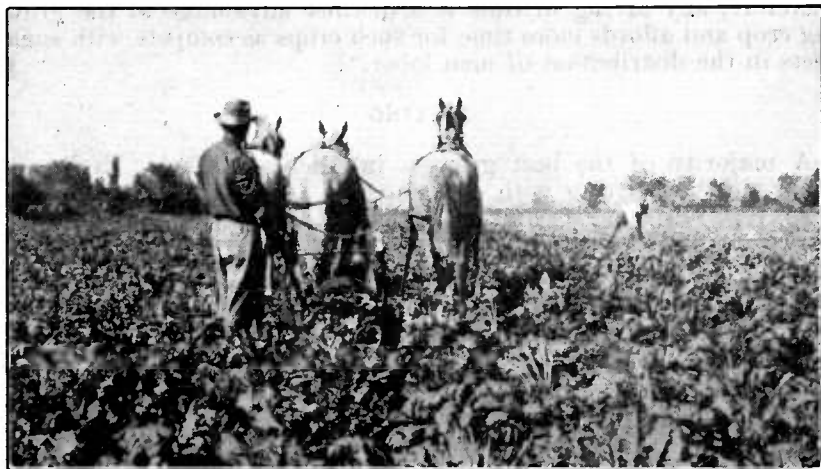


FIG. 15.—Lifting sugar beets with a one-row lifter and three horses. With this equipment approximately 33 per cent more acreage can be lifted in a day than with that shown in Figure 14



FIG. 16.—A one-row lifter operated with four horses. Under favorable conditions this lifter will cover nearly double the acreage in a day that the one shown in Figure 14 covers

mental stage. The man-labor requirement for the hand work in harvesting sugar beets varies from 24 to 30 hours per acre. It is apparent that the time required for this work will be reduced very appreciably when these machines are sufficiently perfected to be of general use. This will in turn release man labor for other important farm work during the fall months. Front and rear views of a mechanical lifter and topper are shown in Figures 18 and 19.

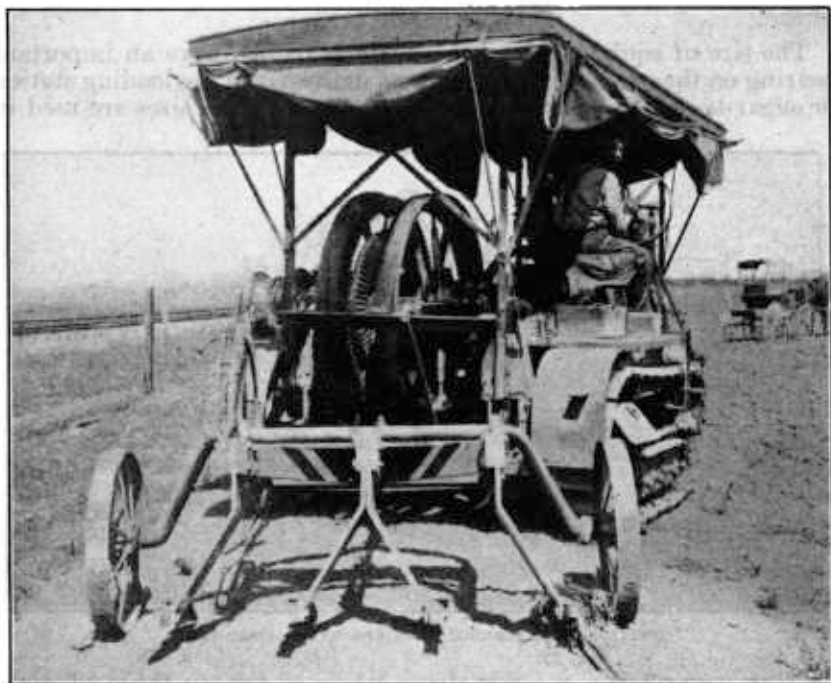


FIG. 17.—A four-row tractor-drawn beet lifter. This lifter will cover 10 to 12 acres per day



FIG. 18.—A mechanical lifter and topper (front view)

HAULING SUGAR BEETS

The size of equipment and the distance hauled have an important bearing on the quantity of sugar beets delivered to the loading station or sugar-beet factory daily. Crews of five different sizes are used in



FIG. 19.—A mechanical lifter and topper (rear view)

hauling sugar beets, ranging from those of two to those of eight horses driven by one man. The distance hauled varies from less than 1 mile to over 5 miles in some instances. The weights of the loads vary with the number of horses used, although there is considerable



FIG. 20.—Hauling a small load of sugar beets to the loading station or beet dump with a crew of one man and two horses. Compare with Figure 21

variation in the tonnage hauled by teams of the same size. Approximately 1 ton of beets per horse is hauled.

In sections where sugar beets are unloaded by a mechanical beet dump, the roadway of the dump may not be wide enough to permit

hitching three horses abreast. Under such conditions the third horse may be hitched ahead of the other two.

Figure 20 shows a small two-horse load of sugar beets on the way to the loading station, Figure 21 a larger load drawn by three horses, whereas Figures 22, 23, and 24 illustrate how man labor may



FIG. 21.—Hauling sugar beets with a crew of one man and three horses. With the same man labor the addition of a third horse to the two-horse team increases by one-third the quantity of sugar beets that can be hauled per load

be further conserved by using more horses and hauling larger loads. In California harvesting is done on a very extensive scale. The quantity of beets represented by Figure 23 (about 8 tons) would, in some other localities, be divided into four loads, requiring three additional drivers.



FIG. 22.—Hauling sugar beets with a crew of one man and four horses. Where four-horse teams are used, twice as much tonnage can be hauled as with two horses. Only one-half the man labor per ton is required

By using more horses and hauling larger loads, thereby reducing the number of trips to the factory or loading station, not only is less man labor required, but the hauling is more liable to be completed before unfavorable fall weather sets in.

It is not practicable for the Michigan, the Colorado, or the Utah farmer who has only four horses, to hire four more horses and haul

as many beets as are shown in Figure 23, nor is it always feasible to add even two horses to the size of team used. But if sufficient horses are available, an increase in the size of the horse crew, or the



FIG. 23.—A crew of one man and eight horses hauling two large loads of beets to the factory. About 8 tons of sugar beets are hauled in these two loads or more than four times the amount represented in Figure 20



FIG. 24.—Hauling four wagon loads of sugar beets with tractor power. This method conserves a maximum amount of man labor

substitution of tractor power for horse power, will contribute much toward the solution of the man-labor problem on farms where sugar beets are grown.

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